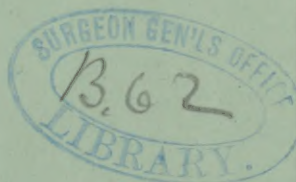


Wigglesworth (Ed.)

AUTO-INOCULATION
OF
VEGETABLE PARASITES OF THE SKIN
AND THE
CLINICAL TESTIMONY FOR THEIR IDENTITY
OR NON-IDENTITY

✓
BY

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REPRINTED FROM THE "ARCHIVES OF DERMATOLOGY," JANUARY, 1878



NEW YORK
G. P. PUTNAM'S SONS
182 FIFTH AVENUE
1878



AUTO-INOCULATION OF VEGETABLE PARASITES OF THE SKIN, AND THE CLINICAL TESTIMONY FOR THEIR IDENTITY OR NON-IDENTITY.*

BY EDWARD WIGGLESWORTH, M. D.

IT was my original intention to place on record in this paper, certain auto-inoculations with the matter resulting from simple inflammation, made, in 1867, to test how far such inoculations would reproduce in successive generations ulcerations resembling those from the poison of chancroids. Pick, of Prague, had made, in 1865, at Zeissl's request, such inoculations upon syphilitic persons with positive results. My own experiments made also under Zeissl's supervision two years later, were upon a healthy subject, namely, myself, and gave also positive results.

These were seen by Zeissl, Hebra, Neumann, Kaposi, and many others and Kaposi subsequently confirmed my results by independent investigations of his own.

As however, Dr. Bumstead has very kindly already made public in his admirable paper upon the "Virus of Venereal Sores" (Trans. Internat. Med. Congress, Phila., 1876.) the sum and substance of the results of my experiments, it is useless to insert here what would be after all a simple reiteration of a plain statement of facts. I confine my remarks therefore to subsequent experiments with vegetable parasites.

Disease processes affecting the skin but not infecting the system and which though contagious, are purely local as to site, may best, be studied by auto-inoculation, and the greater the number of such experiments, the results of which are carefully observed and minutely recorded, the more numerous are our grounds for inference, both as to the nature of the process, and the best means for its destruction.

Every recorded experiment stimulates also new investigations. I have therefore felt justified in recording a few simple inoculations, such as may be performed by any one who has the opportunity, hoping that others may be inclined by the undertaking of similar experiments, and the recording of their results, to increase the number of preliminary data, thus furnishing better, because fuller opportunities for generalization in the direction of etiology, development, and therapy.

* Read by title before the American Dermatological Association, Sept. 4th, 1877.

It is with the clinical effects of the action of the Mycoses, that we are at present concerned. A full consideration of the fungi, botanically considered, is not within the scope of this article; a mere bibliography of the papers on these subjects would exceed our limits. Botanists have as yet no distinct classification of the microscopic fungi in general. Still less are they in accord as to the class the members of which may attack the skin. It is even doubtful if these all belong to one class; or if they do, are they different species, or one species variously modified? If the last, then are these modifications constant under fixed conditions? Is there no miscegenation between different fungi? Individual or exceptional forms of growth hold very varying positions in the estimation of different botanists. Even supposing all forms of parasitic diseases of the skin to be due to one and the same parasite, and supposing all botanists to agree as to the identity of that fungus, yet the clinical difficulties as regards the effects of the presence of the Mycosis remain as before. Is this one fungus inoculable at all stages of its own growth upon every one? Is any one stage of its growth inoculable upon every one? Are the different stages of growth restricted in their inoculability to particular individuals? If so, will they infect his skin regardless of his existing condition of general health, and the peculiarities in the soil which he furnishes to the fungus? Will they affect every layer of his skin, and his skin equally in all parts of his body? Do they require abraded or sound surfaces, and must they be inoculated in a particular manner, e. g., so as to enter a follicle, and is there a special duration of contact required, or a definite period of incubation? What influence is exerted by external attendant conditions, such as heat or cold, dryness or moisture?

The answers to such questions as these can only be determined by a great number of successful inoculations with definitely recognized results, these results, if from the same sources, and under the same conditions, being always identical and separated by well marked lines of demarcation from such results, invariably also identical among themselves, as arise from a different series of identical sources with their own unvarying attendant conditions.

The larger number of my experiments have given no definite results, and need not be alluded to. The inoculations have been made upon the uninjured integument, the abraded rete, the denuded corium, or within follicles; the fungus or the skin have been, one or both, either dry or moist; the methods have been by grafting infected hairs, by simply laying on the materies morbi, by rubbing it in or by pricking it in, and the contact has been temporary or permanent, the fungus in the latter case being covered by a watch crystal fastened to the skin by means of plaster strips; when thus applied, it was found that daily shower-baths could be taken without affecting the growth of the parasite.

This method furnishes retained heat and moisture from perspiration, while preventing removal of the applied material by

friction, and obviating peripheral extension of the disease process.

Oct. 28th, 1871. A favus crust was removed from a patient and inserted under the skin, (slight bleeding) upon the inner aspect of the left forearm, about two inches below the bend of the elbow. Half an inch lower down, the epidermis was scraped away, exposing the papillæ, and another favus crust, powdered and moistened, was laid upon the places, and a watch crystal was fastened over these spots.

Oct. 29. The first crust is pushed out of the wound, and is adherent to the crystal. The wound is normal, a little bluish at the point of incision, and looks if it might suppurate slightly. The moistened powder is now a mass adhering well to the skin, dry at the edges and dark, somewhat fissured; in the centre, moist and of a lighter yellow color; a slight burning pain has been felt at intervals from the beginning. No areolæ nor signs of irritation. No itching except at edge of crystal from pressure.

Two little red spots are situated at a third and a half of an inch respectively, from the mass.

Oct. 31. The wound nearly well. The mass dry. The vesicles healed.

Nov. 1. New vesicles have now formed, one at each end of the incision of the first inoculation.

Nov. 2. The incision is healed, but over the skin, under which the crust had penetrated, the vesiculation is increasing and becoming confluent around a hair, while close by, the lens shows a minute yellow spot.

Nov. 3. Vesicles around the incision are larger, their contents turbid. Vesiculation is beginning at one end of the inoculation upon the rete, where the crusted powder has now dried off. The watch crystal being removed, showed a crop of clear vesicles near its edge, due probably to mechanical irritation.

Nov. 4. All the vesicles disappearing, those at the edge of the glass being turbid.

Nov. 7. Everything normal.

The most marked results were obtained from another series to inoculations.

At the clinic of Dr. White, at the Massachusetts General Hospital on Nov. 2d, Dr. White exhibited a case of favus. Upon calling his attention to the yellow spot upon my arm, we both inoculated ourselves according to Köbner's method. Dr. White's positive results will be found in the Third Annual Report, (1872) of the Massachusetts State Board of Health, page 255. Upon my own arm in a fresh place, three hair follicles were dilated with a needle, and covered and powdered with moistened favus crust, (*Series A*). Two other follicles were inoculated, by working the powdered and moistened crust into them with the needle, (*Series B*). These spots were then covered by two small watch crystals. The crusts when dry, looked as if they were old ones, already growing.

Nov. 3. Turgescence of the hair follicles, and a slight areola around each, gradually fading until Nov. 7.

Nov. 7. One of the first (three) inoculations, (*Series A.*) and both of the second (two) inoculations (*Series B.*) itch, and show a vesicle surrounding the hair follicle.

Nov. 8. Vesicles broken. Slight infiltration. No itching.

Nov. 9. Great exudation of serum. Hair follicle patent.

Nov. 10. Much more serum. Follicles cup-shaped, as if from loss of substance.

Nov. 11. Vesiculation, spreading peripherally. In centre, loss of epithelium in spots. So much serum that the sound epidermis is beginning to macerate.

Nov. 12. The vesiculation has ceased to spread. The points of inoculation are large shallow depressions from loss of epidermis, and are filled with yellowish-brown dry crusts of serum.

Nov. 13. The vesicular ring is shriveling. The central crusts dry and cracked. Watch crystal removed. Nothing more until Nov. 21. On the 18th the microscope showed a few grouped spores, or perhaps propagating cells, in the crust. The hair follicles somewhat eroded, and there were some whitish-yellow bunches around several of the hairs.

Nov. 21. The general vesiculation and irritation nearly gone. Small pustules around the hairs, on which the whitish-yellow bunches were, and these last now extend higher up the shafts of the hairs, these having grown further out.

Nov. 22. Some itching. A strong lens shows a yellowish color, apparently extending deep into the hair follicles.

The whitish-yellow tubes around the hairs have now detached themselves from the follicles, and consist apparently of the epithelium of the follicles detached by the growth of the spores just as is the superficial horny epithelium covering the favus cups, by these last. This suggests that the cup shape of favus may be due to its growth within a follicle, the fungus being better nourished at the sides, or periphery of the follicle, which is now deprived of its lining epithelium, and growing less, of course, in the centre where it is poorly nourished. Moreover, the fungus extends peripherally where the soft tissues offer less resistance than the horny epidermis covering the follicle, which epidermis is, however, finally scaled off when the sides of the favus cup have pushed sufficiently upward to cut it off.

Nov. 27. Desquamation exposes four yellow nodules rising above the surface of the skin, and each pierced by a hair, giving a period of incubation of twenty-five (25) days. These nodules represent Nos. 1 and 3 *Series A*, and 1 and 2 *Series B*.

Nov. 29. Nos. 1 and 3 *A*, and 1 *B*, have scaled, leaving three well marked sulphur colored cups of favus.

Dec. 3. No. 2 *B*, has now become a cup in like manner.

Dec. 9. The cups have enlarged peripherally, the centres are less depressed and of a brownish-yellow, the later-formed periph-

ery being sulphur-colored. The hairs in the centre of the cups are faded in lustre. Edges of older spots, dry, scurfy and detaching.

Dec. 10. The oldest cup No. 1 *B*, is now quite brown. No. 2 *B*, is extending into the sound skin, bright yellow, and pushing before it an areola, raised, but without scales.

Dec. 12. The areola of No. 2 *B*, has now faded, shrivelled, and cracked in centrifugal lines like radii.

Dec. 25. Cup No. 1 *B*, fallen to-day, leaves a red roughness of skin without loss of substance. No. 2 *B*, on the side toward the other inoculations is now brown and branny, like a corn cob, and semi-detached.

During the following night, cups Nos. 1 and 3 *A*, fell, leaving slightly infiltrated prominent red spots.

Dec. 27. Cup No. 2 *B*, fell, leaving a base like that of the others. During the succeeding week several small yellowish blisters appeared at intervals, on the sites of the pre-existing favus cups, dried in twenty-four to forty-eight hours to scabs, which then scaled off and showed the presence of spores. Skin then rapidly became normal.

Of special interest are the natural auto-inoculations, that is, those without my agency.

There appeared on Wednesday, Dec. 6, about an inch from the artificial inoculations, a clearly marked yellowish point smaller than a pin's head.

Dec. 7. The point is surrounded by a dark red, raised, circumscribed areola. Two fresh vesicles have appeared about half an inch from this point.

Dec. 8. Half of the point, and of its areola on the side towards the pre-existing cups, is covered by scales.

Dec. 9. The whole point and areola are scaling.

Dec. 10. Under the whitish scurf, the point is enlarging and turning yellow. The areola is flattening.

Dec. 11. One of the vesicles of Dec. 7, has dried to a scale under which may be seen the favus-color.

Dec. 12. Scale of Dec. 11 has fallen, leaving a favus cup. Duration of incubation is of course unknown.

Dec. 25. This last formed cup is finely grown. The yellowish point of Dec. 6th has disappeared.

Jan. 14. The cup of Dec. 25 has fallen off.

Jan. 25. A small pustule on the site of the cup which fell Jan. 16.

Jan. 30. Pustule has healed, leaving a slight reddish color.

Positive results were also obtained from inoculations made Dec. 26, upon three hair follicles, with the dry dust obtained from the crusts of Nos. 1 and 3, *Series A*, which fell during the night following Dec. 25. The dry dust was pricked into the hair follicles, and covered with a wet rag and plaster.

Jan. 2. Coverings removed, showing three reddish irregular circles, half the size of a gold dollar. The skin is puckered,

as if vesiculation in its initiatory stage were present, and pale where partially raised. The hairs were loose in their follicles, but showed no mycelium or spores.

Jany. 5. One hair follicle quite patent, its tube-shaped epithelium protruding, and enveloping a hair, which is twisted and broken. Paleness of patches gone.

Jany. 7. Patches wine-colored, the whitish cylinder growing upwards upon the base of a faded hair and outside of the follicle.

Jany. 8. A yellowish color at the base of the hairs extending into the skin. Scaliness around the edge of one patch.

Jany. 9. The scaly patch of yesterday has become an unpointing pustule, surrounded by a branny swelling slightly reddened. No pain. Some itching. The other spots are beginning to scale.

Jany. 13. One scale detached. A favus cup is evident on its site. Examined microscopically, this showed spores and mycelium and it left, after removal, a depression or hole on the site of follicle. Incubation eighteen (18) days.

Jany. 15. Another scale detached, leaving another favus cup not rising above the level of the skin. Inoculation twenty (20) days.

Jany. 19. The third favus cup is evident. Incubation twenty-four (24) days.

Jany. 25 and 26. Cups all fallen. Slight pustulation, itching, scaliness, etc., as in former inoculations.

Mar. 1. Everything normal, except mere redness of skin, and that too without any treatment.

The scaliness in these cases was always distinct in appearance from the annular form of *tinea circinata*.

In the Dublin Journal of Medical Science, for May 1875, Dr. W. G. Smith states, that his own arm, and that of Dr. C. Ball, being inoculated with the favus debris, showed after eighteen days indubitable favus cups, but never any appearance of *tinea circinata*.

On Dec. 18, 1873, I experimented with the *Trichophyton*, by taking hairs and scales from the head of a neglected scrofulous child, who had four large well marked patches of *tinea tonsurans* with abundant fungous growth, and rubbing and pricking these when moistened into several hair follicles of my arm, and upon the skin denuded of epithelium. A watch crystal was fastened, by means of plaster strips upon its edges, over the spot.

Dec. 19 to 21. Slight redness, itching, exudation under the skin, raising of epidermis, and peripheral desquamation.

Dec. 22. The red spots slightly depressed, covered each by a horny scale at the point of insertion. The spots gradually faded, but the horny scales increased slightly in thickness and hardness, until Jany. 3, when they split open. The fissure widened upon Jany. 4.

Jany. 5. The fissures are wider still. Where the inoculation was made upon an excoriated surface, the horny scale has ex-

foliated; the epidermis is raised at the periphery of the patch, is dry and forms an irregular circle.

Jany. 18. Itching and gradual extension of the circle, with a raised border now well marked. Within the circle a diffused, dry scaliness.

Jany. 25. The circle is now nearly as large as a silver half-dime.

The circumference is raised sufficiently to be possibly vesicular. A smaller ring is enclosed within the outer one, where the epidermis covering a former smaller vesicular periphery has dried and detached itself. Within the smaller ring, scaliness, and in the very centre of all the skin shows a tendency to become normal again.

Feb. 8. Everything has by degrees returned to its normal condition, without treatment. My other experiments with the trichophyton have given no positive results.

Dr. George H. Rohé, of Baltimore, formerly my assistant at the Boston Dispensary for Skin Diseases, experimented also at my request, and kindly furnishes me with the following notes:

Oct. 5, 1877. Two inoculations were made upon the left arm, flexor surface, with scales from patches of both *tinea tonsurans* and *tinea circinata*.

Oct. 13. Itching at intervals.

Oct. 16. The patch has extended and measures 1 c-m in diameter. Border slightly raised and papular.

Oct. 15. Another inoculation with scales from *tinea circinata* was made upon the same arm, with material from the same case which furnished that for the first inoculation, treatment having been meanwhile pursued.

Oct. 19. The spot first inoculated with *tinea tonsurans* is $\frac{1}{2}$ c-m in diameter, and has a number of hemp seed sized vesicles around its border. Slight itching.

The two *tinea circinata* inoculations show no signs of action.

Oct. 26. The vesicles of the patch have ruptured, and given place to moderately adherent, white, rather large scales. Itching has ceased. A microscopic examination with a $\frac{1}{4}$ Spencer objective, showed numerous mycelia. On this day, another inoculation with scales from this patch.

Nov. 3. The appearance of the patch is that of a typical "Ringworm," oval, $3 \times 3\frac{1}{2}$ c-m., slightly elevated border, slight scaliness, less redness, no itching. The microscope shows many spores, and beautiful mycelium. No action in last spot inoculated, nor in the two inoculated from *tinea circinata*.

With the microsporon furfur, I have never been able to obtain positive results. A few red points make their appearance, there is a slight pricking, and even some soreness, after which the skin rapidly resumes its normal condition. I have had no better success with the Soor fungus of *Oidium Albicans*, which vegetates in the middle and deeper layers of the mucous membrane of the mouth, pharynx, œsophagus and vagina, and, according to Dr.

Steudener, (*Volkmann's Klin. Vorträge*) drives its mycelium strings even into the blood-vessels. Nor have Grawitz (*Virchow's Archiv. Vol. 70,*) and Brefeld (*Vorträge in der bot. Gesch. zu Berlin, 1876,*) and (*Würzt. Verhandl. 1873,*) been more successful, who uphold the identity of the Achorion, the Trichophyton, and the Microsporon, with the fungus of *Oidium lactis* ("Mycoderma vini.") Taken however, from the mouth of a child, and planted in a sort of Pasteur's solution, there cultivated until ripe, and then the pure conidia given in milk to young cats and dogs, the *Oidium lactis* did show itself, after the death of the animals, as apthous patches upon the pharynx, hard palate, tongue and even larynx, where a true abrasion was produced by the fungus.

The clinical observations of Hebra point also to an identity in these parasites. He would, however, consider the *Penicillium* as the common origin. This is the common cosmopolitan mould, occurring, according to Hallier, (*Pflanzlichen Parasiten, 1876,*) upon all decomposing vegetable substances. I have carefully cultivated this fungus upon moistened stale bread, and inoculated it in all stages of its growth, but without positive results.

The fungus of the parasitic form of Sycosis is the Trichophyton, and needs no further mention here. Those from Pellagra and Alopecia Areata have yet to prove that they exist at all. The Chionyphe Carteri, which causes in certain districts in India, the endemic disease Mycetoma, or Madura-foot (*Hirsch. Virch. Arch. XX. VII. 98,*) cannot be regarded as a pure parasite of the skin.

The form of molluscum formerly called contagiosum, has no distinctive parasite, and its contagiousness is very doubtful; although a typical case of this disease, progressing, however, only to the stage of subcutaneous condyloma, did occur upon my own person, some months after expressing with my fingers, for the purpose of examination, some of the contents of a tubercle of molluscum.

There remains only that recently observed form of disease resembling modified vaccinia, called by Tilbury Fox, Impetigo Contagiosum. Fox, Kaposi, Duhring, Taylor, Piffard, Geber, Rohé, Leukowitch, Van Harlingen, and many others as well as myself, have observed, described, inoculated and examined microscopically, cases of this disease. Kaposi and Piffard alone have found a parasite, and it is questionable if this were not an abortive Trichophyton. Certainly as yet, this disease cannot be assigned to any definitely recognized causal fungus. That it is contagious however, there is no doubt. I inoculated myself, by various methods, about a dozen times at intervals. Nearly all the inoculations gave positive results.

At first there was either slight redness, itching or burning, or in other cases, none of these. Then, usually in twenty-four hours, rarely longer, a vesicle would appear, which soon collapsed, drying again in from three days to a week, or less, to a thin yellowish crust,

which turned brown, dried up, and fell off in a few days more. Instead of drying, the vesicles in a few cases became pustules with a slight areola. The crusts were very flat, umbilicated only when a hair passed through them, and rarely confluent.

Where the inoculation was by scarifying, the vesicles took on a linear form. Natural auto-inoculation also occurred. Thus, on Sept. 14, 1877, in the evening, I noticed three small vesicles upon a slightly itching surface, near the dry, straw-colored crust of a former inoculation.

Sept. 16, A. M. Two of these had aborted, but the third was a large well-formed bleb, its contents already slightly turbid.

Wednesday, Sept. 19. The bleb already drying up, but a fresh vesicle, self-inoculated, about half an inch off.

Thursday, Sept. 20. This last vesicle much larger and cloudy. Some itching.

Friday, Sept. 21. Still larger, crusting in centre.

While these two were running a normal course, the crust of the 14th developed a vesiculate circumference and an areola outside of this. The next day this vesiculation had shrunk away, and the site of the areola was now vesiculate, with a fresh areola around it, which last areola vesiculated upon the following day, the original crust in the centre of the patch having become during this time drier and drier. This peripheral extension suggested that of herpes iris.

In several cases, punctiform naevi were inoculated with the products of *Impetigo contagiosum*, and in one case a cure was thus obtained.

In many cases the serum, crusts, and hairs were examined by the microscope, but no parasite could be ever detected.

We see therefore that :—

I. All vegetable parasites of the skin are not inoculable at all times, and upon all persons.

II. Varying degrees of intensity, or duration of application, are needed for successful inoculation of different parasites upon the same skin, the severer cases requiring more thorough inoculation.

III. A healthy skin may resist the action of the less severe but more widely spread Mycoses, but yields to the more thorough inoculation of the more severe and rare forms, showing that the resistant power of the soil furnished is a factor to be regarded.

IV. Extension and intension are in inverse ratio to each other. The milder Mycoses are the more common, and point to an origin upon skins below par in vigor.

V. The various Mycoses of the human integument possess each its own distinguishing characteristics, although a transitory stage of growth of one of them may, in rare cases, as in the "Ring-worm stage" of *Favus*, simulate in appearance one of the forms, temporary or more permanent, of an apparently different species.

VI. While botanical and clinical observations are so at variance in reference to the identity or non-identity of the Mycoses, this question must be regarded as still undecided.

